

Applicant: Friedrich BOECKING  
Docket No. R.306598  
Preliminary Amdt.

**AMENDMENTS TO THE TITLE:**

Please amend the title to read as follows:

--PIEZOELECTRIC-ACTUATOR-CONTROLLED COMMON RAIL INJECTOR  
FOR INTERNAL COMBUSTION ENGINES--

**AMENDMENTS TO THE SPECIFICATION:**

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/EP 2004/002028 filed on September 9, 2004.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] ~~Prior Art~~ **Field of the Invention**

Please replace paragraph [0002] with the following amended paragraph:

[0002] The invention relates to an improved common rail (CR) fuel injector for an internal combustion engine as generically defined by the preamble to claim 1.

Please replace paragraph [0003] with the following amended paragraph:

[0003] A CR injector of [[this]] the type with which this invention is concerned is known from German Patent Disclosure DE 199 36 668 A1. A similar injector is also shown by DE 102 41 462 A1. A CR injector in which the booster piston is actuated by a piezoelectric actuator is known from German Patent DE 195 19 191 C2.

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Please replace paragraph [0006] with the following amended paragraph:

[0006] Advantages of the Invention

### **SUMMARY AND ADVANTAGES OF THE INVENTION**

Please replace paragraph [0007] with the following amended paragraph:

[0007] According to the invention, this object is attained, in an injector for injecting fuel into combustion chambers of internal combustion engines, in particular a piezoelectric-actuator-controlled common rail injector, having control means, predominantly a piezoelectric actuator, disposed in an injector body and operable via at least one booster piston to actuate a control valve received in a valve plate. The injector has a nozzle body on whose (free) end toward the combustion chamber a nozzle outlet is embodied and a nozzle needle which is located axially movably and actuatable in a longitudinal recess of the nozzle body. A throttle disk, closes off the rear end (remote from the nozzle outlet) of the longitudinal recess and located between the nozzle body and the control valve, which throttle disk forms an opening stop for the nozzle needle. The disc cooperates with the rear end face (remote from the nozzle outlet) of the nozzle needle and thus limits the opening stroke of the nozzle needle. A control chamber is embodied between the rear nozzle needle end face and the throttle disk, which chamber is in hydraulic communication with a pressure connection serving to deliver fuel. A cylindrical retaining body is disposed in the injector body and receives the booster piston or pistons and the valve plate that contains the control valve. of the generic type defined at the outset, by the definitive characteristics of claim 1.

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Page 2, please replace paragraph [0008] with the following amended paragraph:

[0008] Advantageous refinements of the fundamental concept of the invention ~~can be learned from claims 2-10 are disclosed.~~

Please replace paragraph [0010] with the following amended paragraph:

[0010] Drawing **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0011] with the following amended paragraph:

[0011] ~~For further illustration of the invention, an exemplary embodiment is used, which is shown in the drawing and described in detail below. The drawing - in Further advantages and features of the invention are described herein below, in conjunction with the single drawing figure which is a fragmentary view [-] shows an embodiment of a CR injector according to the invention, shown in vertical longitudinal section.~~

Please replace paragraph [0012] with the following amended paragraph:

[0012] Description of the Exemplary Embodiment

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

Please replace paragraph [0013] with the following amended paragraph:

[0013] ~~Reference~~ Referring now to the drawing in detail, reference numeral 10 indicates an injector body of a CR injector - intended in particular for use in diesel engines. A sleeve-like booster housing 11 with an offset central axial bore 12 is located in the injector body 10, and a piezoelectric actuator 13 and a booster piston 14 are received axially displaceably in this housing. Between the piezoelectric actuator 13 and the booster piston 14 a booster chamber 15 is embodied. The piezoelectric actuator 13 (which is connected to an electrical power supply in the usual manner which is therefore not shown) is prestressed in

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the direction of an arrow 17, or in other words counter to the direction of action of the piezoelectric actuator 13, by a prestressing spring 16 that surrounds the booster housing 11 and is embodied as a tube spring.

Page 4, please replace paragraph [0019] with the following amended paragraph:

[0019] A nozzle needle, identified overall by reference numeral 33, is disposed axially movably in the longitudinal recess 32. A lower, tapered end of the nozzle needle 33 (not shown) may be embodied conically and cooperates (not shown) with the lower end, forming a valve seat, of the longitudinal recess 32.

Page 5, please replace paragraph [0022] with the following amended paragraph:

[0022] The drawing also clearly shows that fuel at high pressure from the annular chamber 34 reaches a valve chamber 44 of the control valve 20 on the one hand - via a bore 43 - and on the other reaches a control chamber 45 - via the annular gap 36. The control chamber 45 attains its maximum volume in the closing position of the nozzle needle 33, in which the nozzle needle with its end (not shown) closes the nozzle outlet (not shown). In the closing position, the nozzle needle 33 is retained on the one hand by the fluid pressure prevailing in the control chamber 45 and on the other by the compression spring 41.

Please add the following new paragraph after paragraph [0024]:

[0025] The foregoing relates to a preferred exemplary embodiment of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.